

RC0431A (RC431A) Low-Voltage Adjustable Precision Shunt Regulator

Features

- Low voltage operation to 1.24V
- 1% reference voltage tolerance
- Output voltage adjustable from Vref to 12V
- Low 80μ A operational cathode current
- 0.25Ω typical output impedance
- TO-92 and SOT23-5 packages

Applications

Symbol

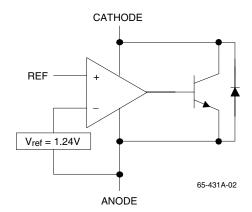
• Voltage reference for discrete power circuits

Description

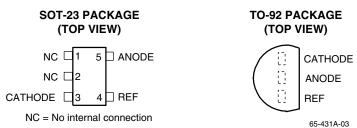
The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched-mode power supplies and modular DC-DC converters. The RC0431A has a low output impedance of active output circuitry offering a very sharp turn-on characteristic. The RC0431A will be an excellent replacement for low-voltage zener diodes in many applications such as on-board regulation and adjustable power supplies.

Anode Cathode

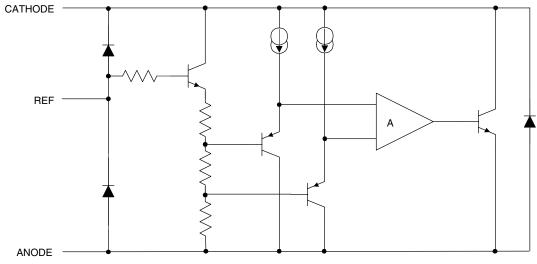
Block Diagram



Pin Assignments



Equivalent Schematic



65-431A-04

Absolute Maximum Ratings

Ratings are over full operating free-air temperature range unless otherwise noted.

Cathode voltage, VKA	13.2V
Continuous cathode current IK	-20mA to 20mA
Reference current, Iref	-0.05mA to 3mA
Power dissipation	See Dissipation Rating Table
Storage temperature range	-65° to 150°C

Notes:

1. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

Recommended Operating Conditions

Parameter	Min.	Max.	Units
Cathode voltage, VKA	VREF	12	V
Cathode current, IK	0.1	15	mA
Operating temperature range in free-air, TA	0	70	۵°

Dissipation Rating Table

Package	Power Rating TA ≤ 25°C	Derating Factor $T_A \ge 25^{\circ}C$	Power Rating TA = 70°C
TO-92	775mW	6.2mW/ºC	496mW
SOT23-5	150mW	1.2mW/₀C	96mW

Electrical Specifications

 $T_A = 25^{\circ}C$ (unless otherwise noted), at free-air

Symbol	Parameters	Conditions	Min.	Тур.	Max.	Units
Vref	Reference Voltage	VKA = Vref, TA = 25°C	1.228	1.24	1.252	V
		$I_{K} = 10 \text{mA},$ $T_{A} = 0 \text{ to } 70^{\circ}\text{C}$	1.221		1.259	
Vref (dev)	Vref deviation over full temperature range (see note 2)	VKA = V_{ref} , IK = 10mA, See note 2 and Figure 1.		4	12	mV
ΔV ref ΔV KA	Ratio of V _{ref} change in cathode voltage change	$I_{K} = 10mA,$ $\Delta V_{KA} = V_{ref}$ to 6V. See figure 2.		-1.5	-2.7	mV
I _{ref}	Reference terminal current	$I_K = 10mA$, R1 = 10KΩ, R2 = ∞ See figure 2.		0.15	0.5	μA
Iref(dev)	I _{ref} deviation over full temperature range (see note 2)	$I_K = 10mA$, R1 = 10KΩ, R2 = ∞ See note 1 & figure 2.		0.05	0.3	μA
lK(min)	Minimum cathode current for regulation	VKA = V _{ref} See figure 1.		55	80	μA
loff	Off-state cathode current	$V_{KA} = 6V, V_{ref} = 0$ See figure 3.		0.001	0.1	μA
IZKAI	Dynamic impedance (see note 3)	$\label{eq:VKA} \begin{array}{l} V_{KA} = V_{ref}, f \leq 1 K Hz \\ I_K = 0.1 mA \ to \ 15 mA, \\ See \ figure \ 1. \end{array}$		0.25	0.4	Ω

Notes:

- 1. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.
- 2. Full temperature range is 0°C to 70°C.
- The deviation parameters V_{ref(dev)} and I_{ref(dev)} are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, ∞V_{ref}, is defined as:

$$\infty V_{ref} |\langle ppm/^{\circ}C \rangle = \frac{\{V_{ref(dev)} / V_{ref} \langle T_A = 25^{\circ}C \rangle\} \times 10^6}{\Delta T_A}$$

where ΔTA is the rated operating free-air temperature range of the device.

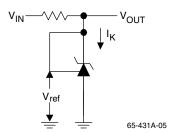
 ${}_\infty V_{ref}$ can be positive or negative depending on whether minimum V_{ref} or maximum V_{ref} , respectively, occurs at the lower temperature.

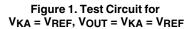
4. The dynamic impedance is defined as: $|Z_{KA}| = \Delta V_{KA} / \Delta I_K$

When the device is operating with two external resistors (see Figure 2), the total dynamic impedance of the circuit is given by:

$$\left| Z_{KA} \right| = \frac{\Delta V}{\Delta I} \approx \left| Z_{KA} \right| \times \left(1 + \frac{R_1}{R_2} \right)$$

Parameter Measurement Information





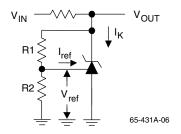
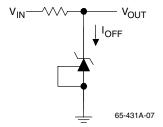
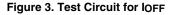
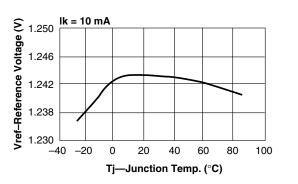


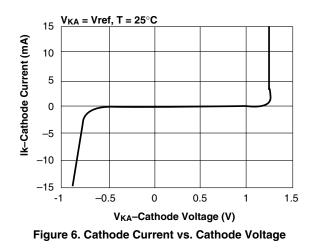
Figure 2. Test Circuit for VKA > VREF, VOUT = VKA = VREF x (1+R1/R2) + IREF x R1











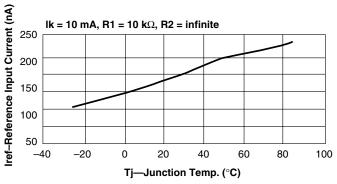
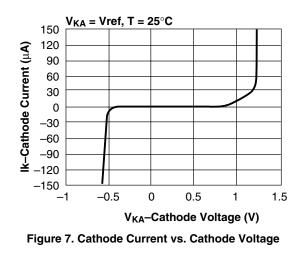


Figure 5. Reference Input Current vs. Junction Temp.



100

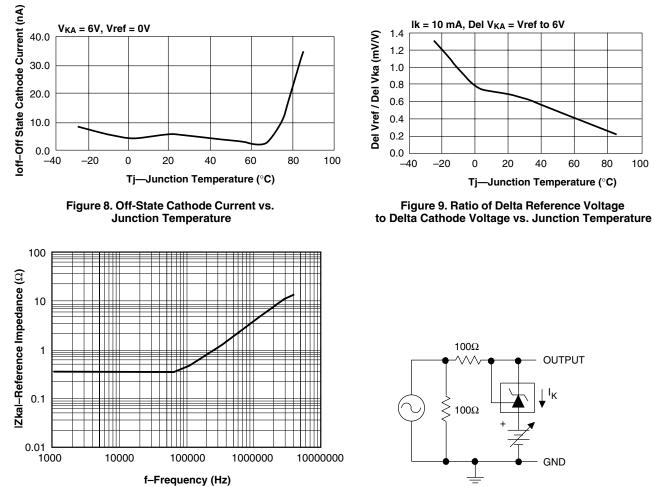
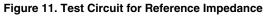


Figure 10. Reference Impedance vs. Frequency

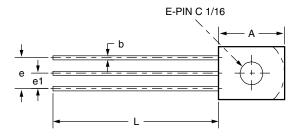


Mechanical Dimensions

TO-92 Package

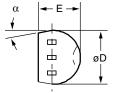
Symbol	Inches		Millim	Notes		
Symbol	Min.	Max.	Min.	Max.	Notes	
А	.170	.210	4.32	5.33		
b	.015	.021	.38	.53		
С	.014	.020	.36	.51		
øD	.175	.205	4.45	5.21		
E	.125	.165	3.18	4.19		
е	.095	.105	2.41	2.67		
e1	.045	.055	1.14	1.40		
L	.500	_	12.70	_		
S	.080	.115	2.03	2.92		
α	4°	6°	4°	6°		





Notes:

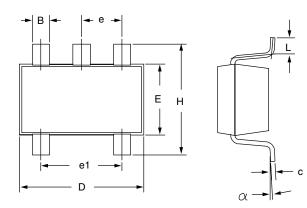
- 1. Package outline exclusive of any mold flashes dimension.
- 2. Package outline exclusive of burr dimension.



Mechanical Dimensions (continued)

SOT23-5 Package

Symbol	Inches		Millim	Notes	
Symbol	Min.	Max.	Min.	Max.	Notes
Α	.170	.195	.90	1.45	
A1	.014	.020	.00	.15	
В	.008	.020	.20	.50	
С	.003	.010	.08	.25	
D	.106	.122	2.70	3.10	
Е	.059	.071	1.50	1.80	
е	.037	BSC	.95	.95 BSC	
e1	.075 BSC		1.90	BSC	
Н	.087	.126	2.20	3.20	
L	.004	.024	.10	.60	
α	0 °	10°	0°	10°	



A1

Notes:

- 1. Package outline exclusive of mold flash & metal burr.
- 2. Package outline exclusive of solder plating.
- 3. EIAJ Ref Number SC-74A.

Ordering Information

Product Number	Package
RC0431AM	SOT23-5
RC0431AT	TO-92

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
- 2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com

Image: Second			L	
Interface Product status/pricing/packaging Datasheet Request samples Juscrete Contents General description Features Applications Datasheet Dottad lina Juscrete General description Features Applications Datasheet Dottad lina Jogie Contents General description Features Applications Datasheet Dottad lina Microcontrollers Non-Volatile General description Product status/pricing/packaging District lina Dottad lina Memory Optoelectronics General description e-mail this datasheet District lina Dottad lina Non-Volatile The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any use between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shum regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched-mode power supplies and modular DC-DC converters. The RC0431A has a low output Vertex: The RC0431A has a low output		1	SEARCH Parametr	ic Cross Reference
Ind products Hordps> ind products Products groups RC0431A Analog and Mixed Product information Signal Contents Discrete General description Features Applications Product status/pricing/packaging Datasheet Logic Product status/pricing/packaging Datasheet Microcontrollers Product status/pricing/packaging Datasheet Memory General description e-mail this datasheet Optoelectronics The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC New output we products RC0431A ha a low output Value between Vref (D-24V)	Fairchild Semiconductor		Inventory	
Ind products Hordps> ind products Products groups RC0431A Analog and Mixed Product information Signal Contents Discrete General description Features Applications Product status/pricing/packaging Datasheet Logic Product status/pricing/packaging Datasheet Microcontrollers Product status/pricing/packaging Datasheet Memory General description e-mail this datasheet Optoelectronics The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC New output we products RC0431A ha a low output Value between Vref (D-24V)		i la		
Products groups RC0431A Related Links Analog and Mixed Product information Request samples Signal Contents Dostrete Interface General description Features Applications Datasheet Download this Logic Product status/pricing/packaging Datasheet Download this Memory General description General description Point status/pricing/packaging Memory General description e-mail this datasheet Distributor and field sales. Poduct selection and parametric search The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from a lower voltage (1.24V) than the traditional shunt regulator references which operate from a lower voltage teference in an isolated feedback circuit for use in switched-mode power supplies and modular DC-DC converters. The RC0431A has a low output How to be ween Vref wee			space Product	Folders and Applica
Products groups RC0431A Related Links Analog and Mixed Product information Request samples Signal Contents Dostrete Interface General description Features Applications Product status/pricing/packaging Datasheet Dostroat lina Memory General description Features Applications Product status/pricing/packaging Datasheet Dostroat lina Memory General description e-mail this datasheet Distribution and field sales. Markets and applications The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output Value between Vref (1.24V)	find products	Home >> Find products >>		
Analog got yearProduct informationRequest samplesAnalog and Mixed, Signal Discrete Interface LogicContents General description Features Applications Product status/pricing/packagingDatasheet Download this datasheetNoticed from How to order products Download this datasheetMemory Optoelectronics Markets and applications Product selection and parametric searchContents of the RC0431A is a low-voltage 3-terminal anglicationsDatasheet Download this datasheetNoticed from How to order products Download this datasheetProduct selection and parametric search cross-reference searchThe RC0431A is a low-voltage 3-terminal anglications Aluste between Vref (1.24V) and 12V using two a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputNotice Decise and modular DC-DC converters. The RC0431A has a low output				Related Links
Analog and wixed Signal Discrete Interface LogicContents General description Features Applications Product status/pricing/packagingDatasheet Download this. datasheetRequest samplesMicrocontrollers Mon-Volatile Memory Optoelectronics Narkets and applications New productsGeneral descriptionDatasheet Product status/pricing/packagingDatasheet Download this. datasheetDotted lina Product Change NoticesMarkets and applications New productsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any 				
Discrete Interface LogicContents General description Features Applications Product status/pricing/packagingDatasileet Download this datasheetHow to order productsMicrocontrollers Non-VolatileProduct status/pricing/packagingDownload this datasheetDownload this datasheetDownload this datasheetMemory OptoelectronicsGeneral descriptione-mail this datasheetDostrad line Dostrad lineMarkets and applications New productsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputThe RC0431A has a low output				
Interface Logic Microcontrollers Non-VolatileProduct status/pricing/packagingInterfactions Product status/pricing/packagingInterface Product status/pricing/packagingMicrocontrollers Non-VolatileGeneral descriptionImage: Control line Product status/pricing/packagingImage: Control line Product status/packagingImage: Control line Product status/packaging <t< th=""><th></th><th></th><th></th><th>Dotted line How to order products</th></t<>				Dotted line How to order products
LogicProduct status/pricing/packagingUnitableProduct Change NoticesMicrocontrollersNon-VolatilePorted LinaSupportMemoryGeneral descriptione-mail this datasheetDottod LinaOptoelectronicsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature 				Dotted line
Microcontrollers Non-VolatileGeneral descriptionPDF(PCNs)Memory OptoelectronicsGeneral descriptione-mail this datasheetDotted line SuportMarkets and applicationsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputPDF(PCNs)my Fairabildmode power supplies and modular DC-DC converters. The RC0431A has a low outputmode power supplies and modular DC-DC converters. The RC0431A has a low outputmode power supplies and modular DC-DC converters. The RC0431A has a low output		Product status/pricing/packaging		Product Change Notices
Non-VolatileGeneral descriptionSupportMemory OptoelectronicsGeneral descriptione-mail this datasheetDatted lineMarkets and applicationsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputSupportSupportw. FairchildGeneral descriptionSupportSupport			PDF	<u> </u>
Memory OptoelectronicsGeneral descriptione-mail this datasheetTotad lineMarkets and applicationsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outpute-mail this datasheet (E-	Non-Volatile			
Markets and applications The RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output This pagePrint version representatives Dottad Line Quality and reliability		General description	e-mail this datasheet	Dotted line
Markets and applications New productsThe RC0431A is a low-voltage 3-terminal adjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputThe RC0431A has a low outputrepresentatives Dotted Line Duality and reliabilityThe RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputThis pagePrint versionrepresentatives	-		[E-	
applications New productsadjustable precision voltage reference regulator. It has an excellent thermal stability over the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputThis pagePrint versionDottad line Quality and reliability Dottad line Design tools		The RC0431A is a low-voltage 3-terminal		
New productsregulator. It has an excellent thermal stabilityresult of the standard commercial temperatureProduct selection and parametric searchover the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputDetted line Design tools		adjustable precision voltage reference	This pagePrint version	
Product selection and parametric searchover the standard commercial temperature range. The output voltage can be set to any value between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low outputDesign tools			I I I I I I I I I I	
Cross-reference searchvalue between Vref (1.24V) and 12V using two external resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output		*		
searchexternal resistors. The RC0431A operates from a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output				
a lower voltage (1.24V) than the traditional shunt regulator references which operate from 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output		external resistors. The RC0431A operates from		
technical information 2.5V. When used with an optocoupler, the buy products 2.5V. When used with an optocoupler, the RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- technical support mode power supplies and modular DC-DC converters. The RC0431A has a low output	<u>bouron</u>			
buy products RC0431A will be an ideal voltage reference in an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output	technical information	<u> </u>		
an isolated feedback circuit for use in switched- mode power supplies and modular DC-DC converters. The RC0431A has a low output	buy products	· · ·		
converters. The RC0431A has a low output		•		
	technical support			
amondance of estive output arouting ottoming a	my Fairchild	<u>^</u>		
impedance of active output circuitry offering a very sharp turn-on characteristic. The				
- RC0431A will be an excellent replacement for	company	• •		

.

back to top

power supplies.

Features

• Low voltage operation to 1.24V

low-voltage zener diodes in many applications such as on-board regulation and adjustable

- 1% reference voltage tolerance
- Output voltage adjustable from Vref to 12V
- Low 80µA operational cathode current
- 0.25 typical output impedance
- TO-92 and SOT23-5 packages

back to top

Applications

• Voltage reference for discrete power circuits

back to top

Product status/pricing/packaging

Product	Product status	Pricing*	Inventory check & ordering	Package marking	Packing method
RC0431AM	Full Production	\$0.429	Purchase	&E&E&Y &O431A&C &.&O&E&V	TAPE REEL
RC0431AT	Full Production	\$0.386	Purchase	\$Y&Z&T 431AT C	BULK
RC0431AMC	Full Production	\$0.429	Purchase	&E&E&Y &O431A&C &.&O&E&V	TAPE REEL
RC0431AMT	Full Production	\$0.429	Purchase	&E&E&Y &O431A&C &.&O&E&V	TAPE REEL

* Fairchild 1,000 piece Budgetary Pricing

back to top

<u>Home</u> | <u>Find products</u> | <u>Technical information</u> | <u>Buy products</u> | <u>Support</u> | <u>Company</u> | <u>Contact us</u> | <u>Site index</u> | <u>Privacy policy</u>

© Copyright 2002 Fairchild Semiconductor